



**Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 8—Minimum Design Standards**

WORKING DOCUMENT
Strawman

**The Department presents these draft materials for stakeholder review and discussion only.
Subject to the Red Tape Reduction review.**

The Missouri Department of Natural Resources has identified 10 CSR 20-8, Minimum Design Standards, as a potential rulemaking amendment. This workgroup has been convened for the purpose of informal and voluntary public participation and discussions regarding the development of this rule prior to initiating formal rulemaking.

Under Governor Greitens' leadership, all state agencies are working to reduce regulations and other government processes that unnecessarily burden individuals and businesses while doing little to protect or improve public health, safety, and our natural resources. The Missouri Department of Natural Resources is committed to limiting regulation to what is necessary to protect Missouri's environment, implementing statutory mandates, and maintaining state control of programs. Any further proposed changes to rules discussed on this page are being developed with these goals in mind. We welcome your comments to help ensure that our regulations provide required protections but do not add unnecessary costs.

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

STRAWMAN DRAFT 12/19/17

**Title 10 – DEPARTMENT OF NATURAL RESOURCES
Division 20 – Clean Water Commission
Chapter 8—*[Design Guides]* Minimum Design Standards**

10 CSR 20-8.140 *[Sewage]* Wastewater Treatment *[Works]* Facilities.

[PURPOSE: The following criteria have been prepared as a guide for the general design requirements for sewage treatment works. This rule is to be used with rules 10 CSR 20-8.110–10 CSR 20-8.220 for the planning and design of the complete treatment facility. This rule reflects the minimum requirements of the Missouri Clean Water Commission as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works and are based on the best information presently available. These criteria were originally filed as 10 CSR 20-8.030. It is anticipated that they will be subject to review and revision periodically as additional information and methods appear. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.]

PURPOSE: The following minimum criteria have been prepared as a standard for the design of wastewater systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.500 for the planning and design of a treatment facility. It is not reasonable or practical to include all aspects of design in these standards. The design engineer may use other appropriate reference materials for these design aspects not addressed in this rule, which include but are not limited to: copies of all ASTM International and American Water Works Association (AWWA) standards pertaining to wastewater systems and appurtenances, design manuals such as Water Environment Federation’s Manuals of Practice, Department prepared guides and other wastewater design manuals containing principles of accepted engineering practice. This rule specifies minimum standards for the design and construction of wastewater systems, in addition to engineering experience and judgement in accordance with standards of practice.

[(1) Definitions. Definitions as set forth in the Clean Water Law and 10 CSR 20-2.010 shall apply to those terms when used in this rule, unless the context clearly requires otherwise. Where the terms shall and must are used, they are to mean a mandatory requirement insofar as approval by the agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.]

[(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day (22,500 gpd) (85.4 m³) or less (see 10 CSR 20-8.020 for the requirements for those facilities).]

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

[(3) Plant Location. The following items shall be considered when selecting a plant site: proximity to residential areas; direction of prevailing winds; accessibility by all-weather roads; area available for expansion; local zoning requirements; local soil characteristics, geology, hydrology and topography available to minimize pumping; access to receiving stream; downstream uses of the receiving stream and compatibility of treatment process with the present and planned future land use, including noise, potential odors, air quality and anticipated sludge processing and disposal techniques. Where a site must be used which is critical with respect to these items, appropriate measures shall be taken to minimize adverse impacts.

(A) Flood Protection. The treatment works structures, electrical and mechanical equipment shall be protected from physical damage by the one hundred (100)-year flood. Treatment works should remain fully operational and accessible during the twenty-five (25)-year flood. This applies to new construction and to existing facilities undergoing major modification.]

(1) Applicability. Wastewater systems shall be designed based on criteria contained in this rule, published standards, applicable federal and state requirements, standard textbooks, current technical literature and applicable safety standards. To the extent of any conflict between the above criteria, the requirement in this rule shall prevail.

(A) This rule shall not apply to animal waste management systems. Regulations for these facilities are found in 10 CSR 20-8.300.

(B) This rule shall not apply to agrichemical facilities. Regulations for these facilities are found in 10 CSR 20-8.500.

(2) General.

(A) Location. Items to be considered when selecting a site are listed in 10 CSR 20-8.110(5)(E)6.

(B) Flood Protection. Flood protection shall apply to new construction and to existing facilities undergoing major modification. The wastewater facility structures, electrical equipment, and mechanical equipment shall be protected from physical damage by not less than the one hundred (100)-year flood elevation or the highest historical flood elevation, whichever is higher.

(C) Minimum Separation Distances.

1. Potable water sources. Unless another distance is determined by the Missouri Geological Survey or by the Department’s Public Drinking Water Branch, the minimum distance between wastewater treatment facilities and all potable water sources shall be at least three hundred feet (300’).

2. Residences. No treatment facility shall be located closer than the minimum distance provided in Table 140-1, included herein.

Table 140-1. Minimum Separation Distance.

Type of Facility	Separation Distance
All discharging facilities with a design average flow of less than 100,000 gpd	50' to a neighboring residence
All discharging facilities with a design average flow of 100,000 gpd or greater	50' to property line
Lagoons	200' to a neighboring residence and 50' to

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

	property line
Recirculating media filters following primary treatment	200' to a neighboring residence

(D) Access Road. An all-weather access road **shall** be provided from a public right-of-way to all pumping stations and wastewater treatment facilities.

([4]3) Quality of Effluent. The *[required]* degree of wastewater treatment **shall** be based on **10 CSR 20-7.015, Effluent Regulations, [and] 10 CSR 20-7.031, Water Quality Standards, and/or appropriate federal regulations including the provisions of the operating permit.**

[(5) Design.

(A) Type of Treatment. As a minimum, the following items shall be considered in the selection of the type of treatment: present and future effluent requirements; location of and local topography of the plant site; space available for future plant construction; the effects of industrial wastes likely to be encountered; ultimate disposal of sludge; system capital costs; system operating and maintenance costs, including basic energy requirements; process complexity governing operating personnel requirements; and environmental impact on present and future adjacent land use.]

(B) Required Engineering Data for New Process Evaluation. The policy of the agency is to encourage rather than obstruct the development of any methods or equipment for treatment of wastewater. The lack of inclusion in these standards of some types of wastewater treatment processes or equipment should not be construed as precluding their use. The agency may approve other types of wastewater treatment processes and equipment under the following conditions: the operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions, to the extent required by the agency; the agency may require monitoring observations, including test results and engineering evaluations, demonstrating the efficiency of the processes, detailed description of the test methods; testing, including appropriately-composited samples, under various ranges of strength and flow rates (including diurnal) and waste temperature over a sufficient length of time to demonstrate performance under climatic and other conditions which may be encountered in the area of the proposed installations and other appropriate information; the agency may require that appropriate testing be conducted and evaluations be made under the supervision of a competent process engineer other than those employed by the manufacturer or developer.

(C) Design Loads.

1. Hydraulic design.

A. New systems.

(I) Undeveloped areas. The design for sewage treatment plants to serve new sewerage systems being built in currently undeveloped areas shall be based on an average daily flow of one hundred (100) gallons per capita (378 l/cap), unless water use data or other justification upon which to better estimate flow is provided.

(II) Existing developed areas. Consideration shall be given in the designs for sewage treatment plants to serve a new sewerage system for a municipality or sewer district for higher flow rates if a large percentage of older buildings are

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

likely to contribute significant infiltration/inflow to the new sanitary sewer system through basement floor drains.

B. Existing systems. Where there is an existing system, the volume and strength of existing flows shall be determined. The determination shall include both dry weather and wet weather conditions. Samples shall be taken and composited so as to be accurately representative of the strength of the wastewater. At least one (1) year's flow data should be taken as the basis for the preparation of hydrographs for analysis to determine the following types of flow conditions of the system: the annual average daily flow—as determined by averaging flows over one (1) year, exclusive of inflow due to rainfall; the minimum daily flow—as determined by observing twenty-four (24)-hour flows during dry weather (low rainfall period) when infiltration/inflow are at a minimum; wet weather peak flows—as determined by observing twenty-four (24)-hour flows during a period of one (1) year when infiltration/inflow are at a maximum; wet weather flows of seven (7)-day duration—as determined by observing for a period of one (1) year the daily flows during the immediate seven (7)-day period following rainfall sufficient to cause ground surface runoff; peak hourly flows—as determined by observing the maximum hydraulic load to the plant; and industrial waste flows—as determined by flow data, including water use records, for each of the industries tributary to the sewer system. The plant design flow selected shall meet the appropriate effluent and water quality standards in 10 CSR 20-7.015 and 10 CSR 20-7.031.

C. Flow equalization. Facilities for the equalization of flows and organic shock load shall be considered at all plants which are critically affected by surge loadings. The sizing of the flow equalization facilities should be based on data obtained from paragraph (5)(C)1. of this rule and 10 CSR 20-8.120(5)(B).

2. Organic design.

A. New system minimum design. Domestic waste treatment design shall be on the basis of at least 0.17 pounds (0.08 kg) of biochemical oxygen demand (BOD) per capita per day and 0.20 pounds (0.09 kg) of suspended solids per capita per day, unless information is submitted to justify alternate designs; when garbage grinders are used in areas tributary to a domestic treatment plant, the design basis should be increased to 0.22 pounds (0.10 kg) of BOD per capita per day and 0.25 pounds (0.11 kg) of suspended solids per capita per day; domestic waste treatment plants that will receive industrial wastewater flows shall be designed to include these industrial waste loads.

B. Existing systems. When an existing treatment works is to be upgraded or expanded, the organic design shall be based upon the actual strength of the wastewater as determined from the measurements taken in accordance with subparagraph (5)(C)1.B. of this rule, with an appropriate increment for growth.

3. Shock effects. *The shock effects of high concentrations and diurnal peaks for short periods of time on the treatment process, particularly for small treatment plants, shall be considered.*

4. Design by analogy. *Data from similar municipalities may be utilized in the case of new systems; however, thorough investigation that is adequately documented shall be provided to the agency to establish the reliability and applicability of the data.*

(D) Conduits. *All piping and channels should be designed to carry the maximum expected*

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

flows. The incoming sewer should be designed for unrestricted flow. Bottom corners of the channels must be filleted. Conduits shall be designed to avoid creation of pockets and corners where solids can accumulate. Suitable gates should be placed in the channels to seal off unused sections which might accumulate solids. The use of shear gates or stop planks is permitted where they can be used in place of gate valves or sluice gates. Noncorrosive materials shall be used for these control gates.

(E) Arrangement of Units. Component parts of the plant should be arranged for greatest operating and maintenance convenience, flexibility, economy, continuity of maximum effluent quality so as to facilitate installation of future units.

(F) Flow Division Control. Flow division control facilities shall be provided as necessary to insure organic and hydraulic loading control to plant process units and shall be designed for easy operator access, change, observation and maintenance. Appropriate flow measurement shall be incorporated in the flow division control design.]

[(6) Plant Details.

(A) Installation of Mechanical Equipment. The specifications should be so written that the installation and initial operation of major items of mechanical equipment will be supervised by a representative of the manufacturer.

(B) Unit Isolation. Properly located and arranged structures and piping shall be provided so that each unit of the plant can be removed from service independently. The design shall facilitate plant operation during unit maintenance and emergency repair so as to minimize deterioration of effluent quality and insure rapid process recovery upon return to normal operational mode.

1. Continuity during construction. Final plan documents shall include construction requirements as deemed necessary by the agency to avoid unacceptable temporary water quality degradation.

(C) Drains. Means shall be provided to de-water each unit to an appropriate point in the process. Due consideration shall be given to the possible need for hydrostatic pressure relief devices to prevent flotation of structures. Pipes subject to clogging shall be provided with means for mechanical cleaning or flushing.

(D) Construction Materials. Due consideration should be given to the selection of materials which are to be used in sewage treatment works because of the possible presence of hydrogen sulfide and other corrosive gases, greases, oils or similar constituents frequently present in sewage. This is particularly important in the selection of metals and paints. Contact between dissimilar metals should be avoided to minimize galvanic action.

(E) Painting. The use of paints containing lead or mercury should be avoided. In order to facilitate identification of piping, particularly in the large plants, it is suggested that different lines be color coded. The following color scheme is recommended for purposes of standardization: sludge line - brown; gas line - orange; potable water line - blue; chlorine line - yellow; sewage line - gray; compressed air line - green; and water lines for heating digesters or buildings - blue with a six inch (6") (15 cm) red band spaced thirty inches (30") (76 cm) apart. The contents shall be stenciled on the piping in contrasting color.

(F) Operating Equipment. A complete outfit of tools, accessories, and spare parts necessary for the plant operator's use shall be provided. Readily accessible storage space and workbench facilities shall be provided and consideration be given to provision of a garage storage area for large equipment, maintenance and repair.

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

(G) Erosion Control During Construction. Effective site erosion control shall be provided during construction.

(H) Grading and Landscaping. Upon completion of the plant, the ground should be graded. Concrete or gravel walkways should be provided for access to all units. Where possible, steep slopes should be avoided to prevent erosion. Surface water shall not be permitted to drain into any unit. Particular care shall be taken to protect trickling filter beds, sludge beds, and intermittent sand filters from stormwater runoff. Provision should be made for landscaping, particularly when a plant must be located near residential areas.]

(4) Design.

(A) Type of Treatment. Items to be considered in selection of the appropriate type of treatment are presented in 10 CSR 20-8.110(5).

(B) New and Innovative Technology. Refer to 10 CSR 20-8.110(6).

(C) Design Period. Identify the design period in the facility plan per 10 CSR 20-8.110(5)(B).

(D) Design Loads.

1. Hydraulic design.

A. Identify flow conditions critical to the design of the wastewater treatment facility as described in 10 CSR 20-8.110(3).

B. The design peak hourly flows shall be used to evaluate the effect of hydraulic peaks on unit processes, pumping, piping, etc.

C. The design of treatment units that are not subject to peak hourly flow requirements shall be based on the design average flow.

2. Organic design. Base organic loadings for wastewater treatment facility design on the information given in 10 CSR 20-8.110(3). When septage is accepted at a wastewater treatment facility, the effects of septage flow shall be evaluated in the design.

([7]5) [Plant] Outfalls.

[(A) Entrance Impact Control. The outfall sewer shall be designed to discharge to the receiving stream in a manner acceptable to the agency. Consideration should be given in each case to the following: preference for free fall or submerged discharge at the site selected; utilization of cascade aeration of effluent discharge to increase dissolved oxygen; limited or complete across stream dispersion as needed to protect aquatic life movement and growth in the immediate reaches of the receiving stream; appropriate effluent sampling in accordance with subsection (7)(C) of this rule.]

[(B)A) Protection and Maintenance. The outfall [sewer] shall be so constructed and protected against the effects of flood water, ice, or other hazards as to reasonably insure its structural stability and freedom from stoppage. [A manhole should be provided at the shore end of all gravity sewers extending into the receiving waters. Hazards to navigation shall be considered in designing outfall sewers.]

[(C)B) Sampling Provisions. All [outfalls] sampling points shall be designed so that a representative and discrete twenty-four (24) hour automatic composite sample or grab sample of the effluent discharge can be obtained at a point after the final treatment process and before discharge to or mixing with the receiving waters.

(C) All outfalls shall be posted with a permanent sign indicating the outfall number (i.e.,

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

Outfall #001).

[(8) Essential Facilities.

(A) Emergency Power Facilities. All plants shall be provided with an alternate source of electric power to allow continuity of operation during power failures, except as noted in this subsection. Methods of providing alternates include the connection of at least two (2) independent public utility sources, such as substations; a power line from each substation is recommended and will be required unless, documentation is received and approved by the agency verifying that duplicate line is not necessary to minimize water quality violations; portable or in place internal combustion engine equipment which will generate electrical or mechanical energy; and portable pumping equipment when only emergency pumping is required.

- 1. Standby generating capacity normally is not required for aeration equipment used in the activated sludge process. In cases where a history of long-term (four (4) hours or more) power outages have occurred, auxiliary power for minimum aeration of the activated sludge will be required. Full power generating capacity may be required by the agency on certain stream segments.*
- 2. Continuous disinfection, where required, shall be provided during all power outages.*

(B) Water Supply.

- 1. General. An adequate supply of potable water under pressure should be provided for use in the laboratory and for general cleanliness around the plant. No piping or other connections shall exist in any part of the treatment works which, under any conditions, might cause the contamination of a potable water supply. The chemical quality should be checked for suitability for its intended uses, such as heat exchangers, chlorinators, etc.*
- 2. Direct connections. Potable water from a municipal or separate supply may be used directly at points above grade for the following hot and cold supplies: lavatory; water closet; laboratory sink (with vacuum breaker); shower; drinking fountain; eye wash fountain; and safety shower. Hot water for any of these units shall not be taken directly from a boiler used for supplying hot water to a sludge heat exchanger or digester heating coils.*
- 3. Indirect connections. A reduced pressure backflow preventer or a break tank shall be used to isolate the potable system from all other plant uses other than those listed in paragraph (8)(B)2. of this rule. Where permanent connections are to be made to uses other than those listed in paragraph (8)(B)2. of this rule, a break tank shall be used. Where a break tank is used, water shall be discharged to the break tank through an air-gap at least six inches (6") above the maximum flood line, ground level or the spill line of the tank, whichever is higher. Backflow preventers shall be located above the maximum flood line or ground level. A sign shall be permanently posted at every hose bib, faucet, hydrant or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking.*
- 4. Separate potable water supply. Where it is not possible to provide potable water from a public water supply, a separate well may be provided. Location and construction of the well should comply with requirements of 10 CSR 60-2.010. Requirements governing the use of the supply are those contained in paragraphs (8)(B)2. and 3. of this rule.*
- 5. Separate non potable water supply. Where a separate non potable water supply is to be provided, a break tank will not be necessary, but all system outlets shall be posted*

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

with a permanent sign indicating the water is not safe for drinking.

(C) Sanitary Facilities. Toilet, shower, lavatory and locker facilities should be provided in sufficient numbers and convenient locations to serve the expected plant personnel.

(D) Laboratory. All treatment works shall include a laboratory for making the necessary analytical determinations and operating control tests, except in individual situations where other arrangements are approved by the agency. The laboratory shall have sufficient size, bench space, equipment and supplies to perform all self-monitoring analytical work required by discharge permits and to perform the process control tests necessary for good management of each treatment process included in the design. The facilities and supplies necessary to perform analytical work to support industrial waste control programs will normally be included in the same laboratory. The laboratory size and arrangement must be sufficiently flexible and adaptable to accomplish these assignments. The layout should consider future needs for expansion in the event that more analytical work is needed.

1. Location and space. The laboratory should be located on ground level, easily accessible to all sampling points, with environmental control as an important consideration. It shall be located away from vibrating machinery or equipment which might have adverse effects on the performance of laboratory instruments or the analyst or design or to prevent adverse effects from vibration. A minimum of four hundred (400) square feet (37m³) of floor space should be allocated for the laboratory. If more than two (2) persons will be working in the laboratory at any given time, one hundred (100) square feet (9.3m³) of additional space should be provided for each additional person. Bench top working surface should occupy at least thirty-five percent (35%) of the total floor space. Minimum ceiling height should be eight feet six inches (8'6") (2 m). If possible this height should be increased to provide for installation of wall-mounted water stills, distillation racks and other equipment with extended height requirements.

2. Materials.

A. Ceilings. Acoustical tile should be used for ceiling except in high humidity areas where they should be constructed of plaster.

B. Walls. For easy maintenance and a pleasant working environment, light colored ceramic tile should be used from floor to ceiling for all interior walls.

C. Floors. Floor surfaces should be either vinyl asbestos or rubber, fire-resistant and highly resistant to acids, alkalies, solvents and salts.

D. Doors. Two (2) exit doors should be located to permit a straight egress from the laboratory preferably at least one (1) to outside the building. Panic hardware should be used. They should have large glass windows for easy visibility of approaching or departing personnel. Automatic door closers should be installed; swinging doors should not be used. Flush hardware should be provided doors if cart traffic is anticipated. Kick plates are also recommended.

3. Cabinets and bench tops. Wall hung cabinets are useful for dust-free storage of instruments and glassware. Units with sliding doors are preferable. They should be hung so the top shelf is easily accessible to the analyst. Thirty inches (30") (76 cm) from the bench top is recommended. One (1) or more cupboard style base cabinets should be provided for storing large items; however, drawer units are preferred for the remaining cabinets. Drawers should slide out so that entire contents are easily visible. They should be provided with rubber bumpers and with stops which prevent accidental removal. Drawers should be supported on ball bearings or nylon rollers which pull easily in

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

adjustable steel channels. All metal drawer fronts should be of double wall construction. All cabinet shelving should be acid resistant and adjustable from inside the cabinet. Water, gas, air and vacuum service fixtures; traps, strainers, overflows, plugs and tailpieces; and all electrical service fixtures shall be supplied with the laboratory furniture. Generally, bench top height should be thirty-six inches (36") (91 cm). However, areas to be used exclusively for sit-down type operations should be thirty inches (30") (76 cm) high and include knee hole space. One-inch (1") (2.54 cm) overhangs and drip grooves should be provided to keep liquid spills from running along the face of the cabinet. Tops should be furnished in large sections one and one-fourth inches (1 1/4") (3.18 cm) thick. They should be field joined into a continuous surface with acid, alkali and solvent resistant cements which are at least as strong as the material of which the top is made.

4. Hoods. Fume hoods to promote safety and canopy hoods over heat releasing equipment shall be installed.

A. Fume hoods.

(I) Location. Fume hoods should be located where air disturbance at the face of the hood is minimal. Air disturbance may be created by persons walking past the hood, supply in diffusers, drafts from opening or closing a door, etc. Safety factors should be considered in locating a hood. If a hood is situated near a doorway, a secondary means of egress must be provided. Bench surfaces should be available next to the hood so that chemicals need not be carried long distances.

(II) Design and materials. The selection of fume hoods, their design and materials of construction must be made considering the variety of analytical work to be performed and the characteristics of the fumes, chemicals, gases or vapors that will or may be released by the activities therein. Special design and construction is necessary if perchloric acid use is anticipated. Consideration should be given for providing more than one (1) fume hood to minimize potential hazardous conditions throughout the laboratory. Fume hoods are not appropriate for operation of heat releasing equipment, that does not contribute to hazards, unless they are provided in addition to those needed to perform hazardous tasks.

(III) Fixtures. A cup sink should be provided inside each fume hood. All switches, electrical outlets, utility and baffle adjustment handles should be located outside the hood. Light fixtures should be explosion proof.

(IV) Exhaust. Twenty-four (24)-hour continuous exhaust capability should be provided. Exhaust fans should be explosion proof. Exhaust velocities should be checked when fume hoods are installed.

(V) Alarms. A buzzer for indicating exhaust fan failure and a static pressure gauge should be placed in the exhaust duct. A high temperature sensing device located inside the hood should be connected to the buzzer.

(VI) Canopy hoods. Canopy hoods should be installed over the bench top areas where hot plate, steam bath or other heating equipment or heat releasing instruments are used. The canopies should be constructed of steel, plastic or equivalent material and finished with enamel to blend with other laboratory furnishings.

5. Sinks. The laboratory shall be equipped with at least one (1) double-wall sink with

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

drainboards. Additional sinks should be provided in separate work areas as needed and identified for the use intended. Sinks should be made of epoxy resin or plastic material with all appropriate characteristics for laboratory applications. Waste openings should be located toward the back so that a standing overflow will not interfere. All water fixtures on which hoses may be used should be provided with reduced zone pressure backflow preventers to prevent contamination of water lines. The sinks should be constructed of material highly resistant to acids, alkalis, solvents and salts, should be abrasion and heat resistant, nonabsorbent and light in weight. Traps should be made of glass, plastic or lead and easily accessible for cleaning.

6. Ventilation and lighting. Laboratories should be separately air conditioned with external air supply for one hundred percent (100%) makeup volume. In addition, separate exhaust ventilation should be provided. Ventilation outlet locations should be remote from ventilation inlets. Good lighting, free from shadows, is important for reading dials, meniscuses, etc., in the laboratory.

7. Gas and vacuum. Natural gas should be supplied to the laboratory. Digester gas should not be used. An adequately sized line source of vacuum should be provided with outlets available throughout the laboratory.

8. Balance and table. An analytical balance of the automatic, digital readout, single pan 0.1 milligram sensitivity type shall be provided. A heavy special design balance table which will minimize vibration of the balance shall be provided. It shall be located as remote as possible from windows, doors or other sources of drafts or air movements, so as to minimize undesirable impacts from these sources upon the balance.

9. Equipment, supplies and reagents. The laboratory shall be provided with all of the equipment, supplies and reagents that are needed to carry out all of the facility's analytical testing requirements. Discharge permit requirements, process control requirements and industrial waste monitoring requirements should be considered when specifying equipment needs.

(E) Floor Slope. Floor surfaces shall be sloped adequately to a point of drainage.

(F) Stairways. Stairways shall be installed wherever possible in lieu of ladders. Spiral or winding stairs are permitted only for secondary access where dual means of egress are provided. Stairways shall have slopes between fifty degrees (50°) and thirty degrees (30°) (preferably nearer the latter) from the horizontal to facilitate carrying samples, tools, etc. Each tread and riser shall be of uniform dimension in each flight. Minimum tread run shall not be less than eight inches (8) (20.3 cm). The sum of the tread run and riser shall not be less than seventeen inches (17") (43 cm) nor more than eighteen inches (18") (46 cm). A flight of stairs shall consist of not more than a twelve-foot (12') (3.7 m) continuous rise without a platform.

(G) Flow Measurement. Flow measurement facilities shall be provided at all plants. Indicating, totalizing and recording flow measurement devices shall be provided for all mechanical plants. Flow measurement facilities for lagoon systems shall not be less than pump calibration time clocks or calibrated flume and shall be provided on both the influent and effluent.]

(6) Essential Facilities.

(A) Emergency Power Facilities.

1. General. All wastewater treatment facilities shall be provided with an alternate

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

source of electric power or pumping capability to allow continuity of operation during power failures.

2. Power for disinfection. Disinfection and dechlorination, when used, **shall** be provided during all power outages.

(B) Electrical Controls. Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, **shall** comply with the **NFPA 70 National Electric Code (NEC) (2017 Edition), as approved and published August 24, 2016**, requirements for Class I, Division 1, Group D locations at a minimum. This standard is incorporated by reference in this rule, as published by National Fire Protection Association[®], 1 Batterymarch Park, Quincy, MA 02169-7471. This rule does not incorporate any subsequent amendments or additions.

(C) Alarm Systems. At a minimum, an audiovisual alarm system with a self-contained power supply to monitor the condition of equipment whose failure could result in a violation of the operating permit **shall** be provided for all wastewater treatment facilities.

(D) Water Supply.

1. General. No piping or other connections **shall** exist in any part of the wastewater treatment facility which, under any conditions, might cause the contamination of a potable water supply.

2. Direct hot water connections. Hot water for any direct connections **shall** not be taken directly from a boiler used for supplying hot water to a digester heating unit or heat exchanger.

3. Indirect connections.

A. Where a potable water supply is to be used for any purpose in a wastewater treatment facility other than direct connections, a break tank, pressure pump, and pressure tank or a reduced pressure backflow preventer consistent with the Department's Public Drinking Water Branch **shall** be provided.

B. A sign **shall** be permanently posted at every hose bib, faucet, hydrant, or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking.

4. Separate non-potable water supply. Where a separate non-potable water supply is to be provided, a break tank will not be necessary, but all system outlets **shall** be posted with a permanent sign indicating the water is not safe for drinking.

(E) Flow Measurement. A means of flow measurement **shall** be provided at all wastewater treatment facilities.

(F) Sampling Equipment. Effluent twenty-four (24) hour composite automatic sampling equipment **shall** be provided at all mechanical wastewater treatment facilities and at other facilities where necessary under provisions of the operating permit. See **10 CSR 20-7.015, Effluent Regulations**.

(G) Housed Facilities. Where wastewater treatment units are in a housed facility, refer to **subsection (7)(J) of this rule** for ventilation.

(977) Safety. Adequate provisions **shall** be made to effectively protect *[the operator]* facility personnel and visitors from hazards^[.]. *[t]*The following **shall** be provided to fulfill the particular needs of each *[plant]* wastewater treatment facility:

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

(A) Fencing. *[enclosure of]* **Enclose** the *[plant]* **facility** site with a fence designed to discourage the entrance of unauthorized persons and animals *[/i>**installation of hand rails and guards around tanks, trenches, pits, stairwells and other hazardous structures;***]*. **The fence design shall include the following:***

- 1. A minimum of five feet (5') in height and constructed of durable materials appropriate to the site and nature of the wastewater treatment facility;**
- 2. A minimum of four feet (4') clearance from all process units should be provided to permit easy access for operation and maintenance;**
- 3. At least one (1) lockable gate provided for access of maintenance equipment and vehicles. Gates should be constructed in a manner and of materials comparable to those used for the fence. Gates should be designed to prohibit entry of the enclosure by crawling underneath. When sizing the gate, give consideration to the need for entry of mowing equipment, biosolids trucks, or other vehicles or equipment necessary for routine maintenance and operation; and**
- 4. At least one (1) warning sign placed on each side of the facility enclosure and each gate in such positions as to be clearly visible from all directions of approach. Include the minimum wording “WASTEWATER TREATMENT FACILITY – KEEP OUT”. Fabricate signs of durable materials with characters at least two inches (2") in height and securely fastened to the fence;**

(B) Gratings over appropriate areas of treatment units where access for maintenance is necessary;

(C) *[provision of f]* **First[-]** aid equipment;

(D) *[posting of]* **Posted** “No Smoking” signs in hazardous areas;

(E) *[provision of]* **Personal** protective *[clothing and]* equipment (**PPE**) *[such as air pacs]* (e.g., **self-contained breathing apparatus**, goggles, gloves, hard hats, safety harnesses **and line, hearing protectors**, etc.);

(F) *[provision of p]* **Portable blower** and *[sufficient]* hose **sufficient to ventilate accessed confined spaces;**

(G) *[p]* **Portable lighting equipment** *[approved by the United States Bureau of Mines]* complying with **NEC** requirements. See **subsection (6)(B) of this rule;** *[and]*

(H) Gas detectors listed and labeled for use in **NEC** Class I, Division 1, Group D locations. See **subsection (6)(B) of this rule;**

(I) *[a]* **Appropriately-placed warning signs** for slippery areas, non-potable water fixtures (see **subparagraph (6)(D)3.B. of this rule**), low head clearance areas, open service manholes, hazardous chemical storage areas, flammable fuel storage areas, **high noise areas**, etc.;

(J) Ventilation. Ventilation shall include the following:

- 1. Isolate all pumping stations and wastewater treatment components installed in a building where other equipment or offices are located from the rest of the building by an air-tight partition, provide separate outside entrances, and provide separate and independent fresh air supply;**
- 2. Force fresh air into enclosed screening device areas or open pits more than four feet (4') deep. Also see **10 CSR 20-8.130(3)(G);****
- 3. Dampers. Dampers are not to be used on exhaust or fresh air ducts. Fine screens or other obstructions on exhaust or fresh air ducts should be avoided to prevent clogging;**
- 4. Continuous ventilation. Where continuous ventilation is needed (e.g., housed**

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

facilities), provide at least twelve (12) complete air changes per hour. Where continuous ventilation would cause excessive heat loss, provide intermittent ventilation of at least thirty (30) complete air changes per hour when facility personnel enter the area. Base air change demands on one hundred percent (100%) fresh air;

5. Electrical controls. Mark and conveniently locate switches for operation of ventilation equipment outside of the wet well or building. Interconnect all intermittently operated ventilation equipment with the respective wet well, dry well, or building lighting system. The manual lighting/ventilation switch is expected to override the automatic controls. For a two (2) speed ventilation system with automatic switch over where gas detection equipment is installed, increase the ventilation rate automatically in response to the detection of hazardous concentrations of gases or vapors; and

6. Fans, heating, and dehumidification. Fabricate the fan wheel from non-sparking material. Provide automatic heating and dehumidification equipment in all dry wells and buildings. Refer to **subsection (6)(B) of this rule** for electrical controls;

(K) Explosion-proof electrical equipment, non-sparking tools, gas detectors etc., in work areas where hazardous conditions may exist, such as digester vaults and other locations where potentially explosive atmospheres of flammable gas or vapor with air may accumulate. See **subsection (6)(B) of this rule**;

(L) Provisions for local lockout/tagout on stop motor controls and other devices;

(M) Provisions for an arc flash hazard analysis and determination of the flash protection boundary distance and type of PPE to reduce exposure to major electrical hazards in accordance with **NFPA 70E Standard for Electrical Safety in the Workplace (2018 Edition), as approved and published August 21, 2017**. This standard is

incorporated by reference in this rule, as published by National Fire Protection Association[®], 1 Batterymarch Park, Quincy, MA 02169-7471. This rule does not incorporate any subsequent amendments or additions; and

(N) Provisions for confined space entry complying with national industry safety standards.

(8) Chemical Handling.

(A) *[Hazardous Chemical Handling]* **General.**

1. Containment materials. The materials utilized for storage, piping, valves, pumping, metering, splash guards, etc., **shall** be specially selected considering the physical and chemical characteristics of each hazardous or corrosive chemical.

[2. Secondary containment. Chemical storage areas shall be enclosed in dikes or curbs which will contain the stored volume until it can be safely transferred to alternate storage or released to the wastewater at controlled rates which will not damage the facilities, inhibit the treatment processes, or contribute to stream pollution. Liquid polymer should be similarly contained to reduce areas with slippery floors, especially to protect travelways. Non slip floor surfaces are desirable in polymer-handling areas.]

2. Secondary containment. Secondary containment **shall** be designed as follows:

A. A minimum volume of one hundred twenty-five percent (125%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area when not

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

protected from precipitation;

B. A minimum volume of one hundred ten percent (110%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area when protected from precipitation;

C. No discharge outlet or gravity drain through the wall or floor of the containment structure; and

D. Construct the walls and floors of the secondary containment structure of suitable material that is compatible with the specifications of the product being stored.

[3. Eye wash fountains and safety showers. Eye wash fountains and safety showers utilizing potable water shall be provided in the laboratory and on each floor level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading. These facilities are to be as close as practicable to possible chemical exposure sites and are to be fully useful during all weather conditions. The eye wash fountains shall be supplied with water of moderate temperature— fifty degrees to ninety degrees Fahrenheit (50° – 90 °F) (ten degrees to thirty-two degrees Celsius (10° – 32 °C)), separate from the hot water supply, suitable to provide fifteen to thirty (15 – 30) minutes of continuous irrigation of the eyes. The emergency showers shall be capable of discharging thirty to fifty gallons per day (30 – 50 gpm) (1.9 – 3.2 l/s) of water at moderate temperature at pressures of twenty to fifty pounds per square inch (20 – 50 psi) (1.41 – 3.52 kgf/cm²). The eye wash fountains and showers shall be no more than twenty-five feet (25') (7.6 m) from points of hazardous chemical exposure.]

*[4]3. Splash guards. All pumps or feeders for hazardous or corrosive chemicals **shall** have guards which will effectively prevent spray of chemicals into space occupied by **facility** personnel. *[The splash guards are in addition to guards to prevent injury from moving or rotating machinery parts.]**

*[5]4. Piping, labeling, **and** coupling guard[s,] locations.*

A. All piping containing or transporting corrosive or hazardous chemicals **shall** be identified with labels every ten feet (10') [(3.0 m)] and with at least two (2) labels in each room, closet, or pipe chase. *[Color coding may also be used but is not an adequate substitute for labeling.]*

B. All connections (flanged or other type), except **those** adjacent to storage or feeder areas, **shall** have guards which will direct any leakage away from space occupied by **facility** personnel. *[Pipes containing hazardous or corrosive chemicals should not be located above shoulder level except where continuous drip collection trays and coupling guards will eliminate spray or dripping onto personnel.]*

[6. Protective clothing and equipment. The following items of protective clothing or equipment shall be available and utilized for all operations or procedures where their use will minimize injury hazard to personnel: respirators, air supply type recommended for protection against chlorine; chemical workers' goggles or other suitable goggles (safety glasses are insufficient); face masks or shields for use over goggles; rubber gloves, rubber aprons with leg straps; rubber boots (leather and wool clothing should be avoided near caustics); and safety harness and line.]

*[7]5. [Warning] **Alarm** system [and signs]. Facilities **shall** be provided for automatic*

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

shutdown of pumps and sounding of alarms when failure occurs in a pressurized chemical discharge line. *[Warning signs requiring use of goggles shall be located near chemical unloading stations, pumps and other points of frequent hazard.]*

[8]6. Dust *[collection]*. Dust collection equipment shall be provided to protect facility personnel from dusts injurious to the lungs or skin and to prevent polymer dust from settling on walkways **which become slick when wet**. *[The latter is to minimize slick floors which result when a polymer-covered floor becomes wet.]*

(B) Chemical Housing. The following shall be provided to fulfill the particular needs of each chemical housing facility:

1. Provide storage for a minimum of thirty (30) days' supply, unless local suppliers and conditions indicate that such storage can be reduced without limiting the supply;
2. Construct the chemical storage room of fire and corrosion resistant material;
3. Equip doors with panic hardware. To prevent unauthorized access, doors lock but do not need a key to exit the locked room using the panic hardware;
4. Provide chemical storage areas with drains, sumps, finished water plumbing, and the hose bibs and hoses necessary to clean up spills and to wash equipment;
5. Construct chemical storage area floors and walls of material that is suitable to the chemicals being stored and that is capable of being cleaned;
6. Floor surfaces should be smooth, chemical resistant, slip resistant, and well drained with three inches per ten feet (3"/10') minimum slope;
7. Provide adequate lighting;
8. The lights and electrical equipment comply with the **NEC** recommendation based on the chemicals stored. See **subsection (6)(B) of this rule**;
9. Chemical containers should be stored in a cool, dry, and well-ventilated area;
10. Design vents from feeders, storage facilities, and equipment exhaust to discharge to the outside atmosphere above grade and remote from air intakes;
11. Avoid storing chemical containers in direct sunlight;
12. Maintain storage temperatures between forty degrees and eighty-six degrees Fahrenheit (40 - 86 °F);
13. Humidity control may be necessary when storing dry chemicals;
14. Design the storage area with designated areas for "full" and "empty" chemical containers;
15. Provide storage rooms housing flammable chemicals with an automatic sprinkler system designed for four tenths gallons per minute per square foot (0.4 gpm/ft²) and a minimum duration of twenty (20) minutes;
16. To ensure the safety of facility personnel and the wastewater treatment system, store incompatible chemicals separately. Store any two (2) chemicals that can react to form a toxic gas in separate housing facilities;
17. Properly design and isolate areas intended for storage and handling of chlorine and sulfur dioxide and other hazardous gases. Refer to **10 CSR 20-8.190(3)** and **10 CSR 20-8.190(4)** for chlorine and dechlorination;
18. Properly design an isolated fireproof storage area and explosion proof electrical outlets, lights, and motors for all powdered activated carbon storage and handling areas in accordance with federal, state, and local requirements;

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

19. Vent acid storage tanks to the outside atmosphere, but not through vents in common with day tanks;

20. Keep concentrated acid solutions or dry powder in closed, acid-resistant shipping containers or storage units; and

21. Do not handle concentrated liquid acids in open vessels, but pump in undiluted form from the original container to the point of treatment or to a covered storage tank.

(C) Chemical Handling Design. The following shall be provided, where applicable, for the design of chemical handling:

1. Make provisions for measuring quantities of chemicals used for treatment or to prepare feed solutions over the range of design application rates;

2. Select storage tanks, piping, and equipment for liquid chemicals specific to the chemicals;

3. Install all liquid chemical mixing and feed installations on corrosion resistant pedestals;

4. Provide sufficient capacity of solution storage or day tanks feeding directly for twenty-four (24)-hour operation at design average flow;

5. Provide a minimum of two (2) chemical feeders for continuous operability.

Provide a standby unit or combination of units of sufficient capacity to replace the largest unit out-of-service;

6. Chemical feeders shall—

A. Design the chemical feed equipment to meet the maximum dosage requirements for the design average flow conditions;

B. Able to supply, at all times, the necessary amounts of chemicals at an accurate rate throughout the range of feed;

C. Provide proportioning of chemical feed to the rate of flow where the flow rate is not constant;

D. Design chemical feeders to be readily accessible for servicing, repair and observation;

E. Protect the entire feeder system against freezing;

F. Locate the feeder system reasonably adjacent to points of application to minimize length of feed lines;

G. Provide for both automatic and manual operation for chemical feed control systems;

H. Consider automatic chemical dose or residual analyzers and, where provided, include alarms for critical values and recording charts;

I. Provide screens and valves on the chemical feed pump suction lines; and

J. Provide an air break or anti-siphon device where the chemical solution enters the water stream;

7. Dry chemical feed system shall—

A. Equip each dry chemical feeder with a dissolver which is capable of providing a minimum retention period of five (5)-minutes at the maximum feed rate;

B. Polyelectrolyte feed installations should be equipped with two (2) solution vessels and transfer piping for solution makeup and daily operation;

C. Design the makeup tanks with an eductor funnel or other appropriate arrangement for wetting the polymer during the preparation of the stock feed

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

- solution;**
 - D. Provide adequate mixing by means of a large diameter, low-speed mixer;**
 - E. Make provisions to measure the dry chemical volumetrically or gravimetrically; and**
 - F. Completely enclose chemicals and prevent emission of dust;**
 - 8. For phosphorus removal, give consideration to systems including pumps and piping that will feed either iron or aluminum compounds to provide flexibility;**
 - 9. Provide for uniform strength of solution consistent with the nature of the chemical solution for solution tank dosing;**
 - 10. Diaphragm or piston type positive displacement type solution feed pumps are not acceptable to feed chemical slurries;**
 - 11. Provide continuous agitation to maintain slurries in suspension;**
 - 12. Provide a minimum of two (2) flocculation tanks or channels having a combined detention period of twenty to thirty (20 – 30) minutes. Provide independent controls for each tank or channel;**
 - 13. Insulate pipelines carrying soda ash at concentrations greater than twenty percent (20%) solution to prevent crystallization; and**
 - 14. Do not store bagged soda ash in a damp or humid place.**
- (D) Chemical Safety. Provide the following in addition to the safety provisions in **section (7) of this rule:****
- 1. PPE. The following items of PPE **shall** be available and utilized for all operations or procedures where their use will minimize injury hazard to facility personnel:**
 - A. Self-contained breathing apparatus recommended for protection against chlorine and other hazardous fumes;**
 - B. Chemical worker’s goggles or other suitable goggles (safety glasses are insufficient);**
 - C. Face masks or shields for use over goggles;**
 - D. Dust mask to protect the lungs in dry chemical areas;**
 - E. Rubber gloves;**
 - F. Rubber aprons with leg straps; and**
 - G. Rubber boots (leather and wool clothing should be avoided near caustics);**
 - 2. Eye wash fountains and safety showers. Eye wash fountains and safety showers utilizing potable water **shall** be provided in the laboratory and on each floor level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading. The design of eye wash fountains and safety showers **shall** include the following:**
 - A. Supply eye wash fountains with water of moderate temperature, fifty degrees to ninety degrees Fahrenheit (50° – 90°F), suitable to provide fifteen to thirty (15 – 30) minutes of continuous irrigation of the eyes;**
 - B. Supply emergency showers capable of discharging twenty gallons per minute (20 gpm) of water of moderate temperature, fifty degrees to ninety degrees Fahrenheit (50° – 90°F), and at pressures of thirty to fifty pounds per square inch (30 – 50 psi);**
 - C. Locate eye wash fountains and emergency showers no more than twenty-five feet (25') from points of hazardous chemical exposure; and**
 - D. Eye wash fountains and showers are to be fully operable during all weather**

LEGEND:

Text to be *[deleted]* is in italics and bracketed.

Added text is **bolded**.

conditions; and

3. Warning signs. Warning signs requiring use of goggles shall be located near chemical stations, pumps, and other points of frequent hazard.

[9.](E) Chemical Container [i]Identification. The identification and hazard warning data included on shipping containers, when received, shall appear on all containers (regardless of size or type) used to store, carry, or use a hazardous substance. [Sewage and sludge sample containers should be adequately labeled. Following is a suitable label for a sewage sample:]

[RAW SEWAGE

Sample point No.

Contains Harmful Bacteria.

May contain hazardous or toxic material.

Do not drink or swallow.

Avoid contact with openings or breaks in the skin.]

(9) Pump and Haul.

(A) General.

1. Accessibility. Conform to subsection (2)(D) of this rule.

2. Security. Refer to subsection (7)(A) of this rule for fencing.

3. Protection of water supplies. Provide the separation and crossing of water supplies in accordance with subsection (2)(C) of this rule and 10 CSR 20-8.120(5).

(B) Septic Tank Design. Conform to 10 CSR 20-8.180(2) for septic tank design. In addition, the septic tank design shall provide a minimum of thirty (30) days detention time.

(C) Earthen Basin Design. Refer to 10 CSR 20-8.200 for earthen basin design.

(D) Alarm system. The alarm shall be activated in cases of high water levels. Refer to subsection (6)(C) of this rule for alarm systems.

AUTHORITY: section 644.026, RSMo Supp. 1989. Original rule filed Aug. 10, 1978, effective March 11, 1979.*

**Original authority 1972, amended 1973, 1987, 1993.*